

Photolytic Destruction of Volatile Organic Compounds (VOCs)

Southwest Division, Naval Facilities Engineering Command

Process Technologies Incorporated

Photolytic Destruction of Volatile Organic Compounds (VOCs)

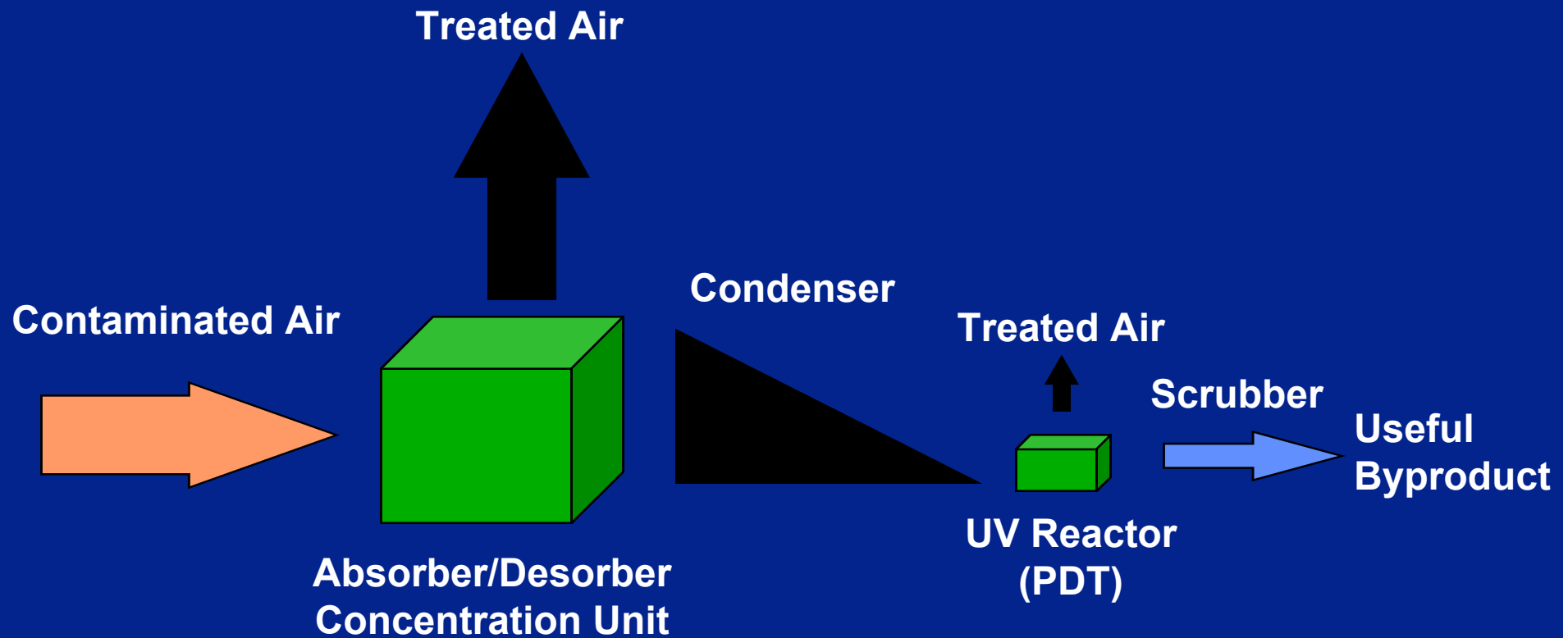
■ *Technology Information*

- Site Information
- Contracting Approach
- Technology Application
- Revelations

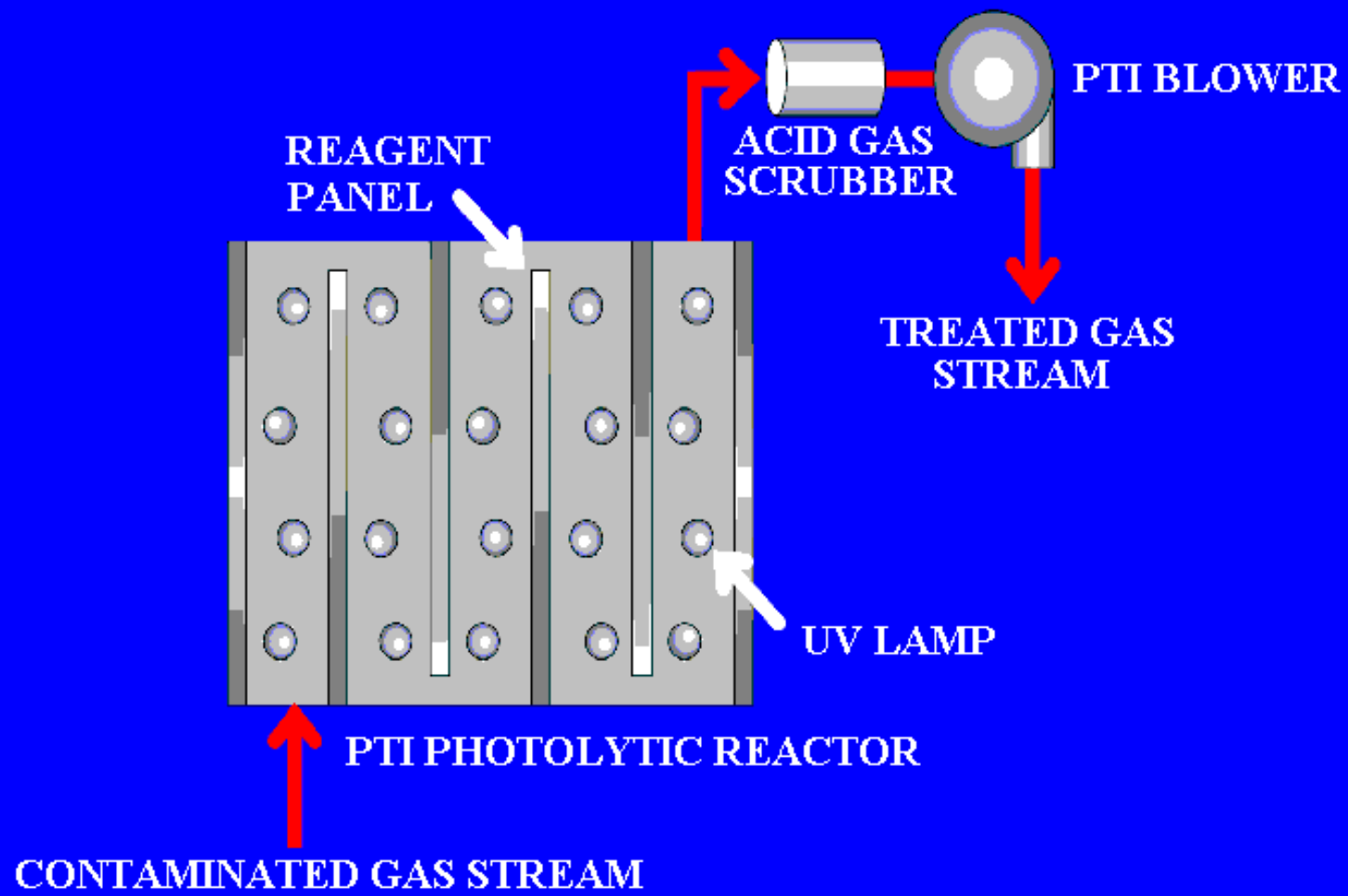
Technology Information

- **Photolytic destruction is the use of an artificial light source to photochemically oxidize halogenated hydrocarbons into free radicals and hydrocarbon chains**
- **Considerations:**
 - Low flowrate of highly concentrated gas stream
 - SVE or other off-gas collection system
 - Temperature within reactors less than 250 degrees F
 - Halogenated hydrocarbons

Treatment Process Steps



PHOTOLYTIC DESTRUCTION TECHNOLOGY



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Site Information

■ Naval Air Station, North Island, CA - IR Site 9

38 acres

Chemical waste disposal area solvents, acids, caustics, coatings

Octane, toluene, PCE, TCE, DCE

Side by side technology comparisons

Carbon adsorption

Thermal oxidation

Photolytic destruction

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Contracting Approach

- Performance-based payment concept
- Cost plus pounds of VOCs treated
- Allowed vendor to prove technology with less risk to the Navy

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Technology Application

■ Demonstration Phases

Phase I Parametric Testing Configurations

Concentration Condensation Photolytic Destruction

Concentration Condensation

Concentration Photolytic Destruction

Phase II: Steady-State Operation

Phase III: Final Report for Cost Comparison

Technology Application (cont.)

■ Operational parameters (Steady-State Operation)

SVE flowrate: 239 to 307 scfm (~350 scfm total with make-up air)

Residence time in concentrator: 9 seconds

Operating vacuum: 0 to 35 inches of water

Reactor volume: 9 cubic feet

Residence time in reactor: 3 minutes

System throughput: 0.83 to 1.45 pounds VOCs/hour

Gas inlet temperature: 83 to 113 degrees F

Technology Application (cont.)

■ Application Results:

Exhaust gas cleanup goal: 25 ppmv

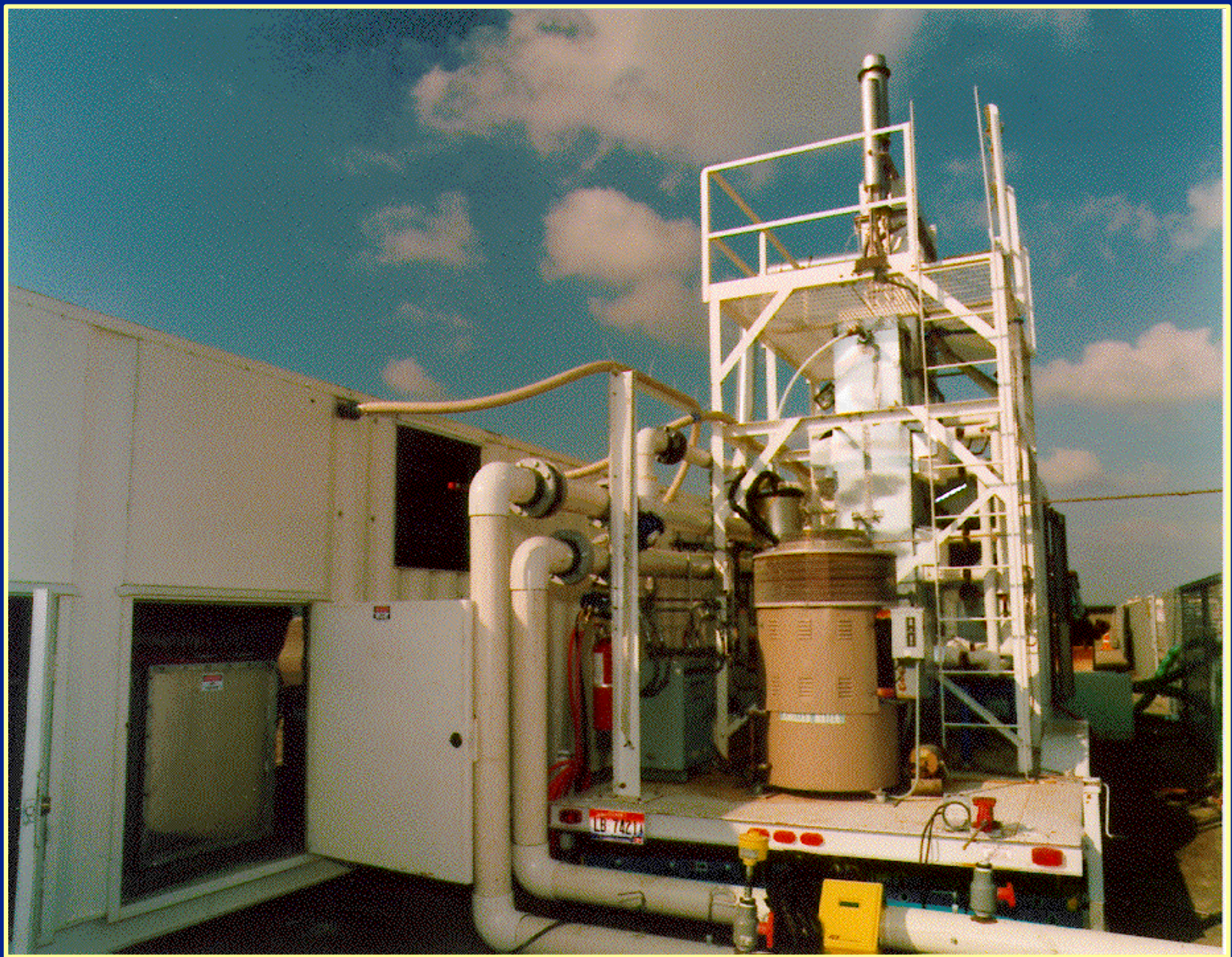
Untreated concentration (average): 192.04 ppmv

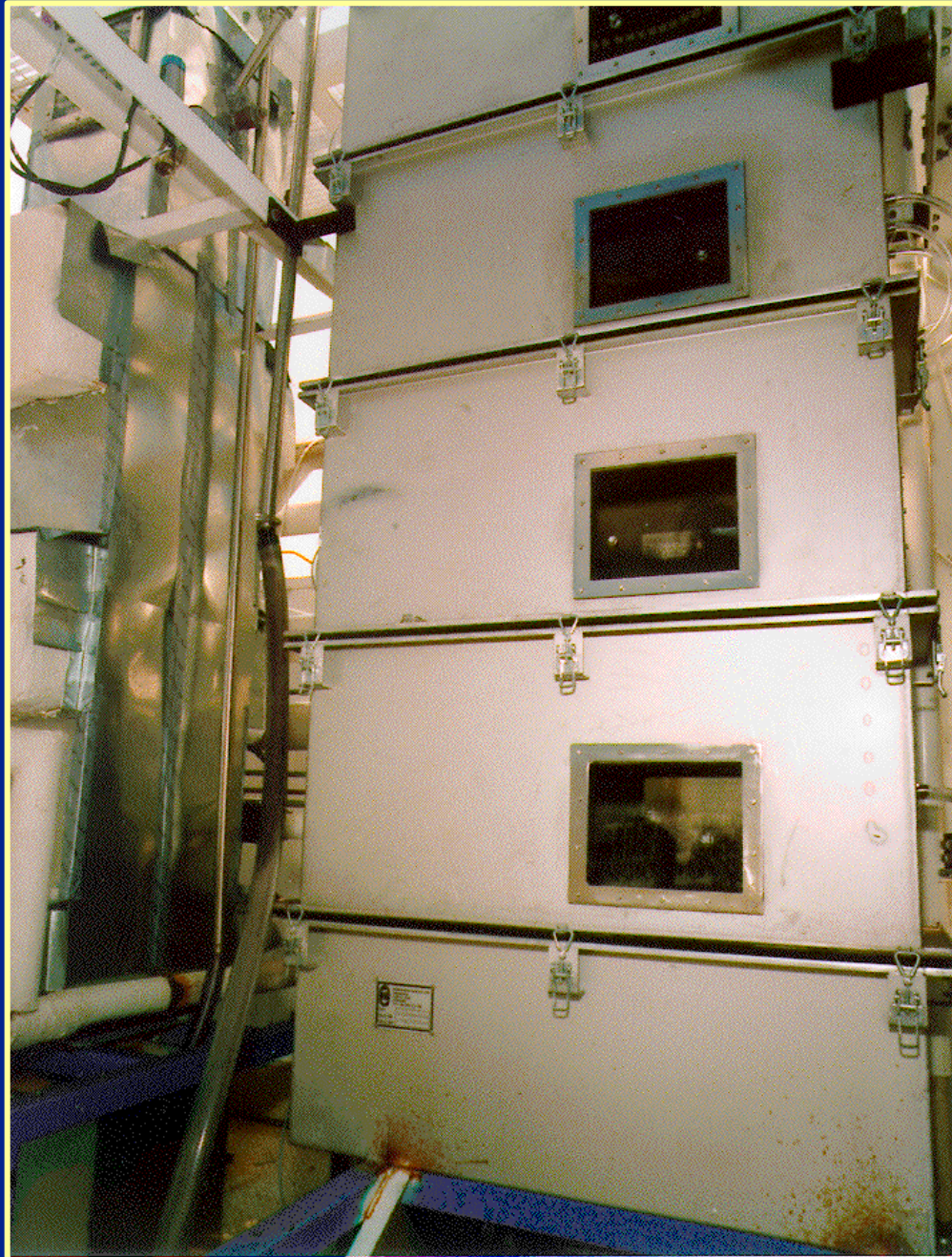
Treated concentration (average): 11.10 ppmv

Percent removal (average): 94.22%

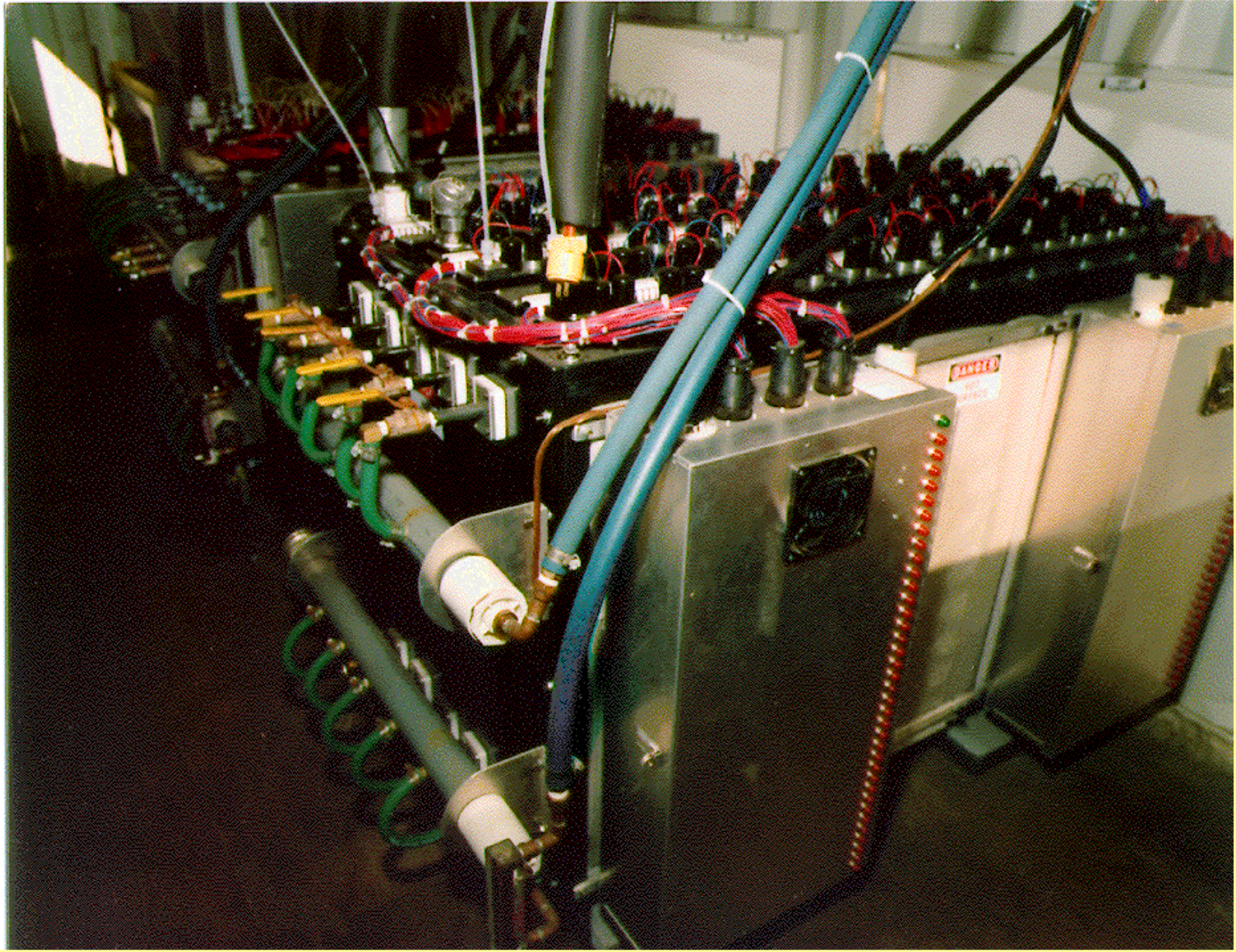
Destruction removal efficiency within reactor (DRE - average): 97.29%

VOCs treated: 1,151 pounds









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- *Revelations*

Revelations

■ Advantages

- Lower cost compared to conventional technologies

- Destroys hard-to-remediate compounds (halogenated hydrocarbons)

- High destruction removal efficiency

- Minimal byproducts

■ Disadvantages

- Need existing SVE or other off-gas collection system which may be expensive to install

- Need to concentrate gases for maximum process efficiency, which adds to the cost of the system

Revelations (cont.)

■ Implementation Costs

Contract Fixed Cost: \$89,985 (work plan, mobilization, setup, sampling and analysis, demobilization, reporting)

Performance-Based Payment: \$3,740 (chemical and physical treatment based on 1,151 pounds of VOCs \$3.25 per pound of VOC treated)

Total Field Demonstration Cost: \$93,725

■ Scale-up Costs

3,000 scfm system (all SVE wells on site)

\$3.77 per pound VOC treated

Revelations (cont.)

■ Regulatory Issues

Exhaust gases must be monitored

Small amounts of waste byproducts may be produced much of which is non-hazardous and inexpensive to dispose of

Wastewater from process may be disposed of under existing permits

■ Lessons Learned

First fast track BAA

Innovative contracts are possible and can be successful

Too much work for contractor to accomplish in short time frame

Points of Contact

- **Remedial Project Manager**

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- **Contracting Officer's Technical Representative**

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